Long-Baseline Interferometric Study of Binary Stars: Status and Prospects

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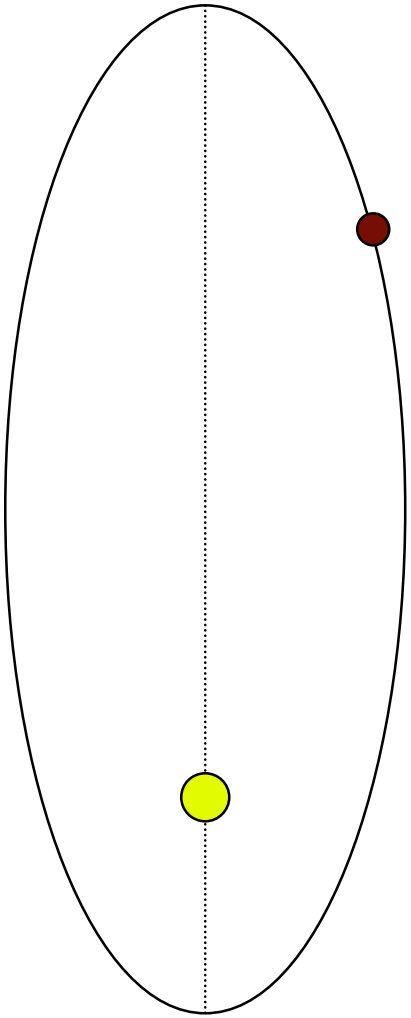
Basic Concept Review

- Nature Likes to Make Stars in Multiple Systems (> *50%*)
- Binary Stars are the Hydrogen Atoms of Stellar Astrophyics
  - Their (gravitational) interactions are simple enough that they can be exploited to infer fundamental properties of the stellar constituents
  - Model *is* Simple: Keplerian Motion
- Of all the Fundamental Parameters, Mass is the Most Fundamental (But *Not* the Only…)

$$\tau^2 \propto a^3 \Big/ (m_1 + m_2)$$



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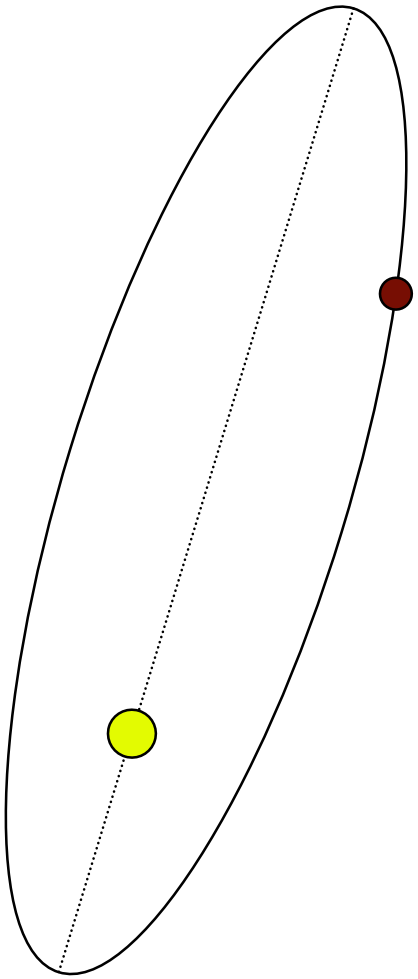
Basic Concept Review (2)

- Spectroscopic Study Gives Line-of-Sight Kinematics
  - Physical Scale in Radial Dimension
  - Keplerian Parameters: e, τ, T_0, K's, One Euler Angle (ω)
- Astrometric (Relative Position) Study Gives Scale 3-Space Geometry
  - Motion in Time Uniquely Defines All Three Euler Angles (i, Ω, ω)
  - Angular Scale of Orbit (a'')
- Synthesis of Both (Double-Lined Orbit) Gives Physical Scale For System
  - Component Masses, Luminosities, System Distance



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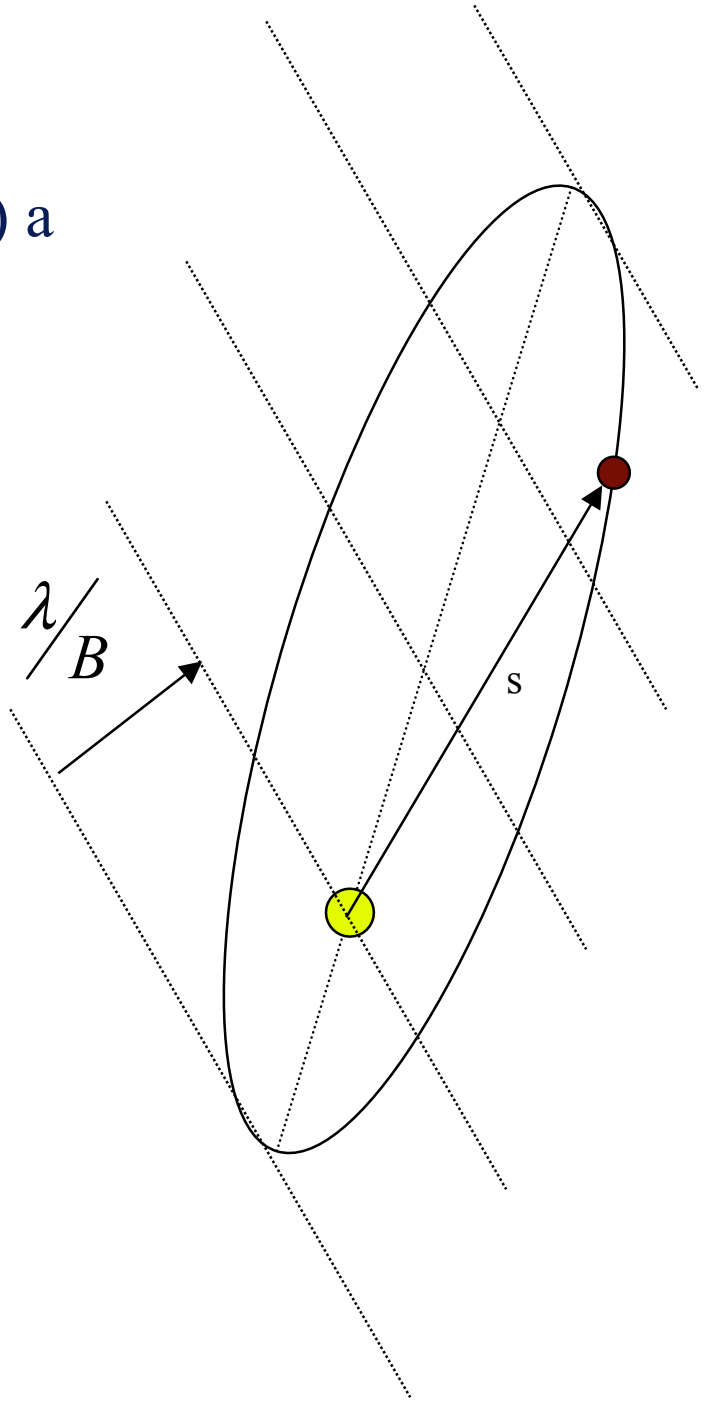
Basic Concept Review (3)

- Interferometric Resolution (V, V^2) a *Proxy* For Relative Astrometry

$$V = \frac{V_1 + rV_2 \exp(2\pi i/\lambda \, B \bullet s)}{1 + r}$$



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Binary Phase Space

- Long-Baseline Interferometers Specialize in High Angular Resolution
  - Small Separations
  - Short Period Systems
  - Or Distant Systems

From DM 91

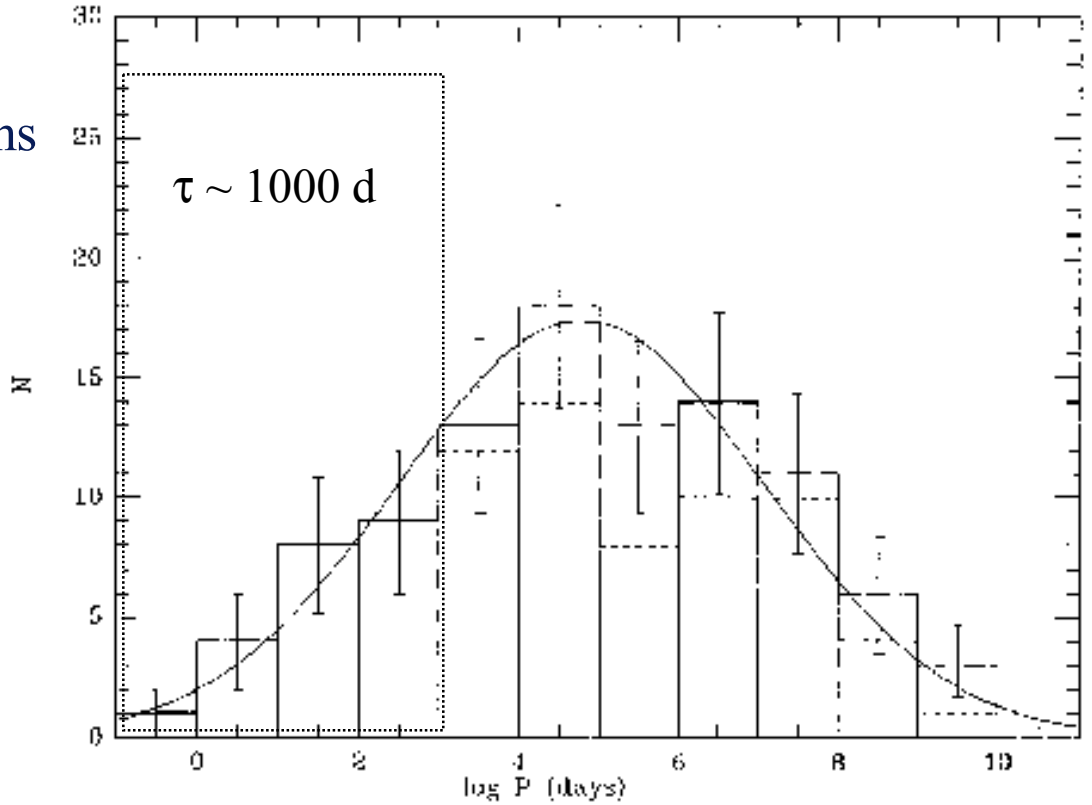

Fig. 7. Period distribution in the complete nearby G-dwarf sample, without (dashed line) and with (continuous line) correction for detection biases. A Gaussian-like curve is represented whose parameters are given in the text

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PTI Short Period Systems

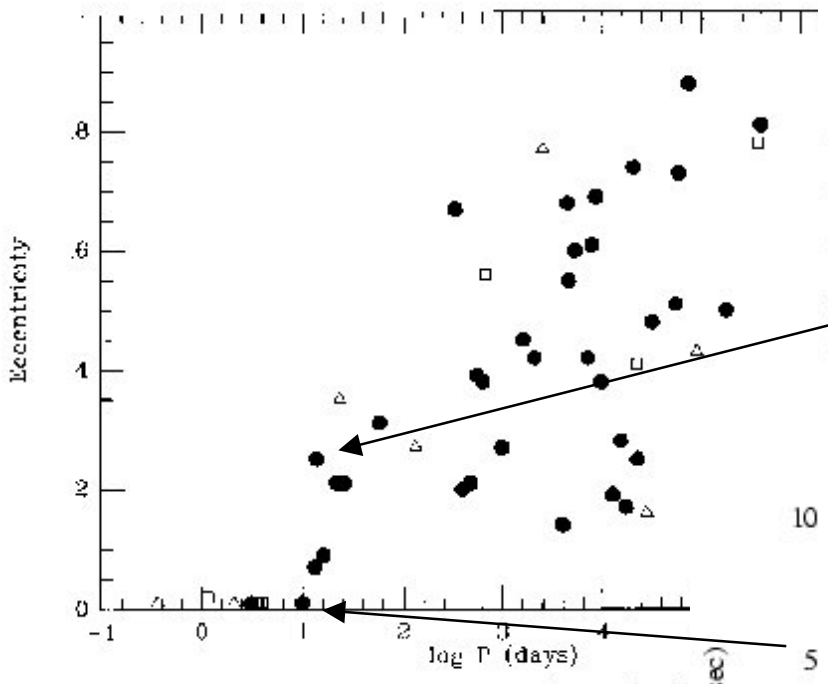
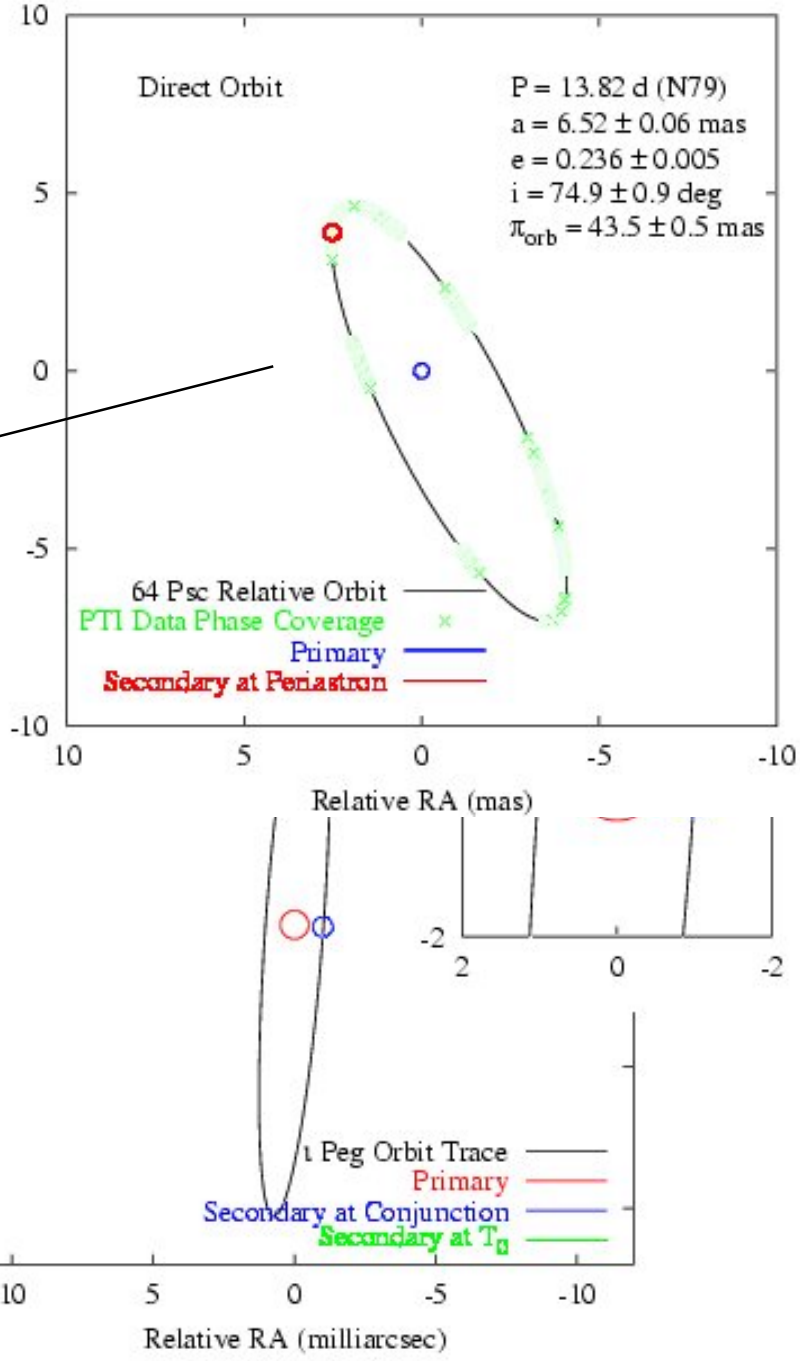


Fig. 5. Diagram eccentricity versus period for the complete nearby G-
the strong circularization effect due to tidal stresses for short periods bi
are according to the multiplicity of the system: • double, ∧ triple. [



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